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TITLE: Three-fluid magnetohydrodynamic modeling of the solar wind in the outer heliosphere

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ABSTRACT BODY: We have developed a three-fluid, fully three-dimensional magnetohydrodynamic model of the solar wind plasma in the outer heliosphere as a co-moving system of solar wind protons, electrons, and interstellar pickup protons, with separate energy equations for each species. Our approach takes into account the effects of electron heat conduction and dissipation of Alfvénic turbulence on the spatial evolution of the solar wind plasma and interplanetary magnetic fields. The turbulence transport model is based on the Reynolds decomposition of physical variables into mean and fluctuating components and uses the turbulent phenomenologies that describe the conversion of fluctuation energy into heat due to a turbulent cascade. We solve the coupled set of the three-fluid equations for the mean-field solar wind and the turbulence equations for the turbulence energy, cross helicity, and correlation length. The equations are written in the rotating frame of reference and include heating by turbulent dissipation, energy transfer from interstellar pickup protons to solar wind protons, and solar wind deceleration due to the interaction with the interstellar hydrogen. The numerical solution is constructed by the time relaxation method in the region from 0.3 to 100 AU. Initial results from the novel model are presented.

KEYWORDS: [2164] INTERPLANETARY PHYSICS / Solar wind plasma, [2149] INTERPLANETARY PHYSICS / MHD waves and turbulence, [2152] INTERPLANETARY PHYSICS / Pickup ions, [2134] INTERPLANETARY PHYSICS / Interplanetary magnetic fields.

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